

Improving Road Safety in Singapore

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Authorities involved in Road Safety

LTA

Road safety engineering

Vehicle safety standards

TRAFFIC POLICE

Enforcing traffic regulations

Road safety education

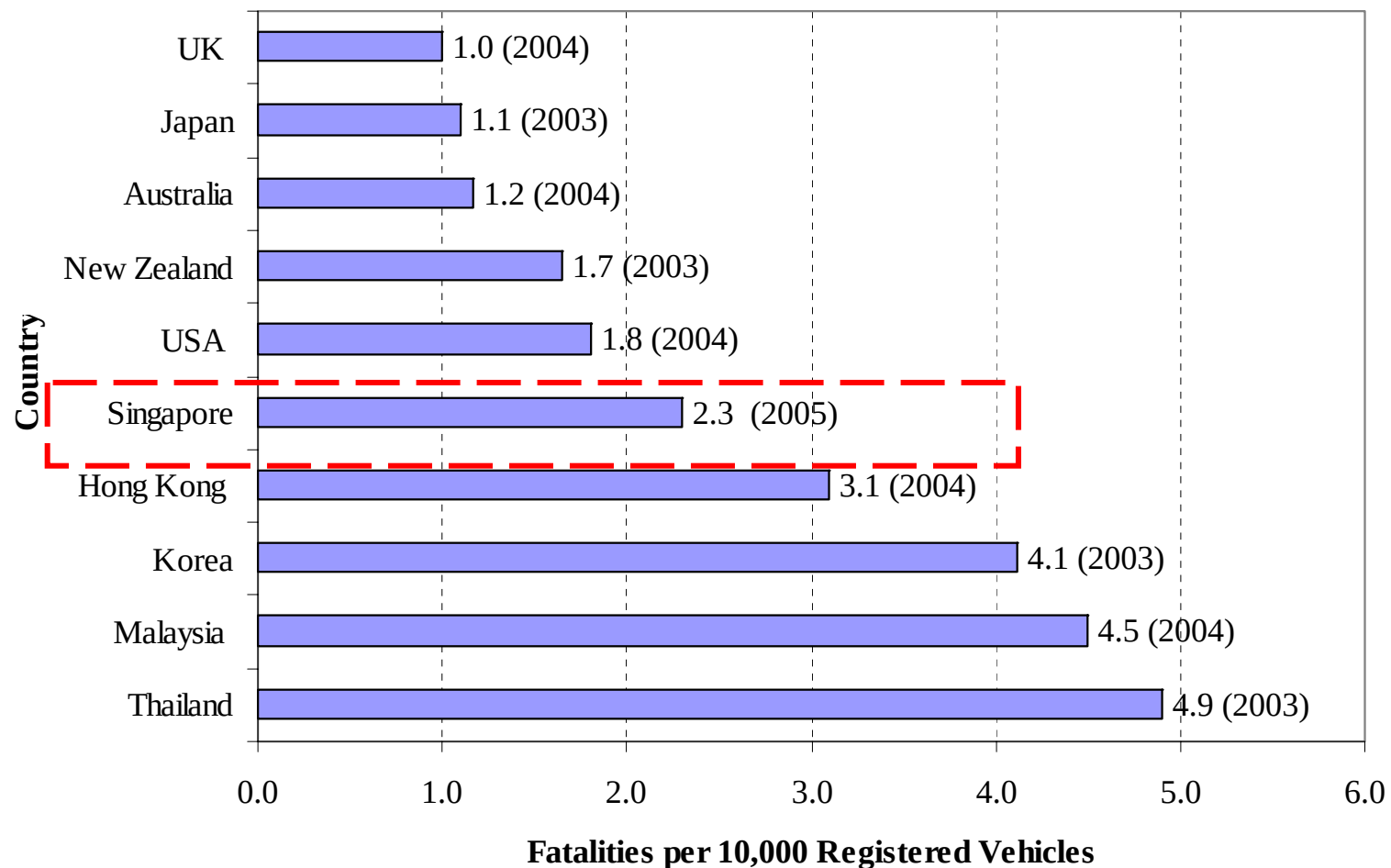
Accident investigation

NATIONAL SAFETY COUNCIL

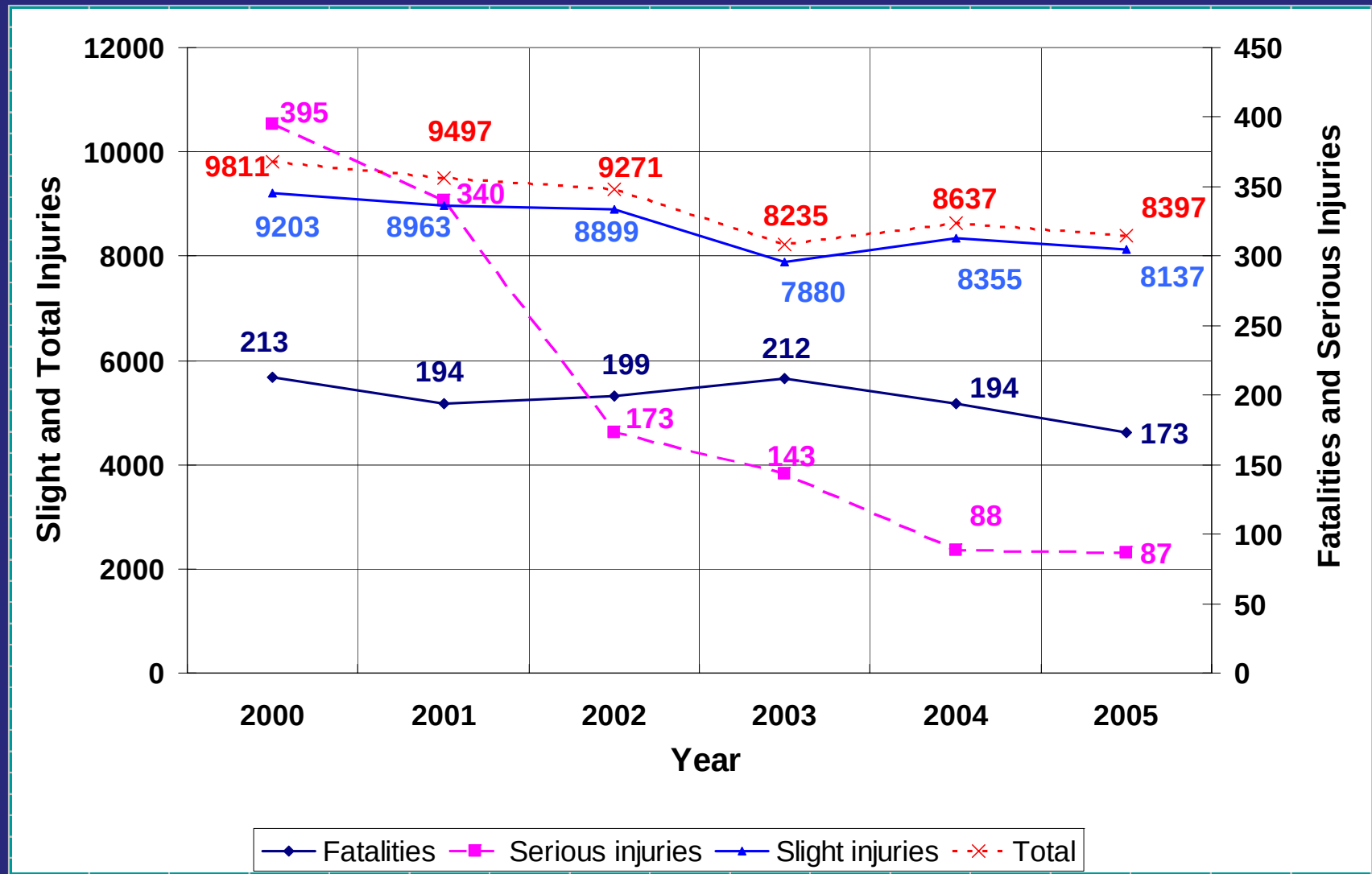
Publicity

Campaigns

International Comparison of Road Accident Fatality Rate

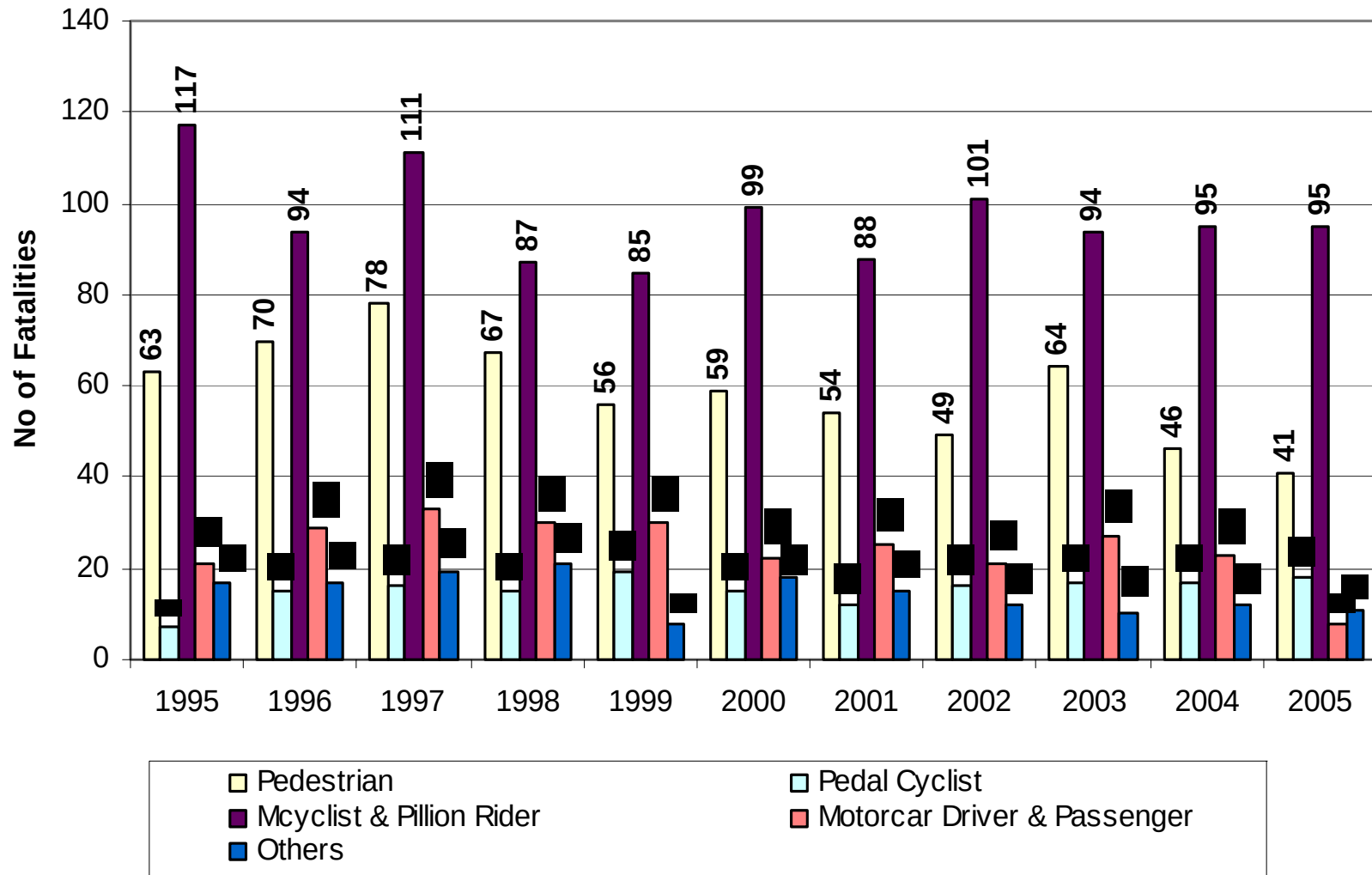


Road Accident Situation In Singapore (2000-2005)

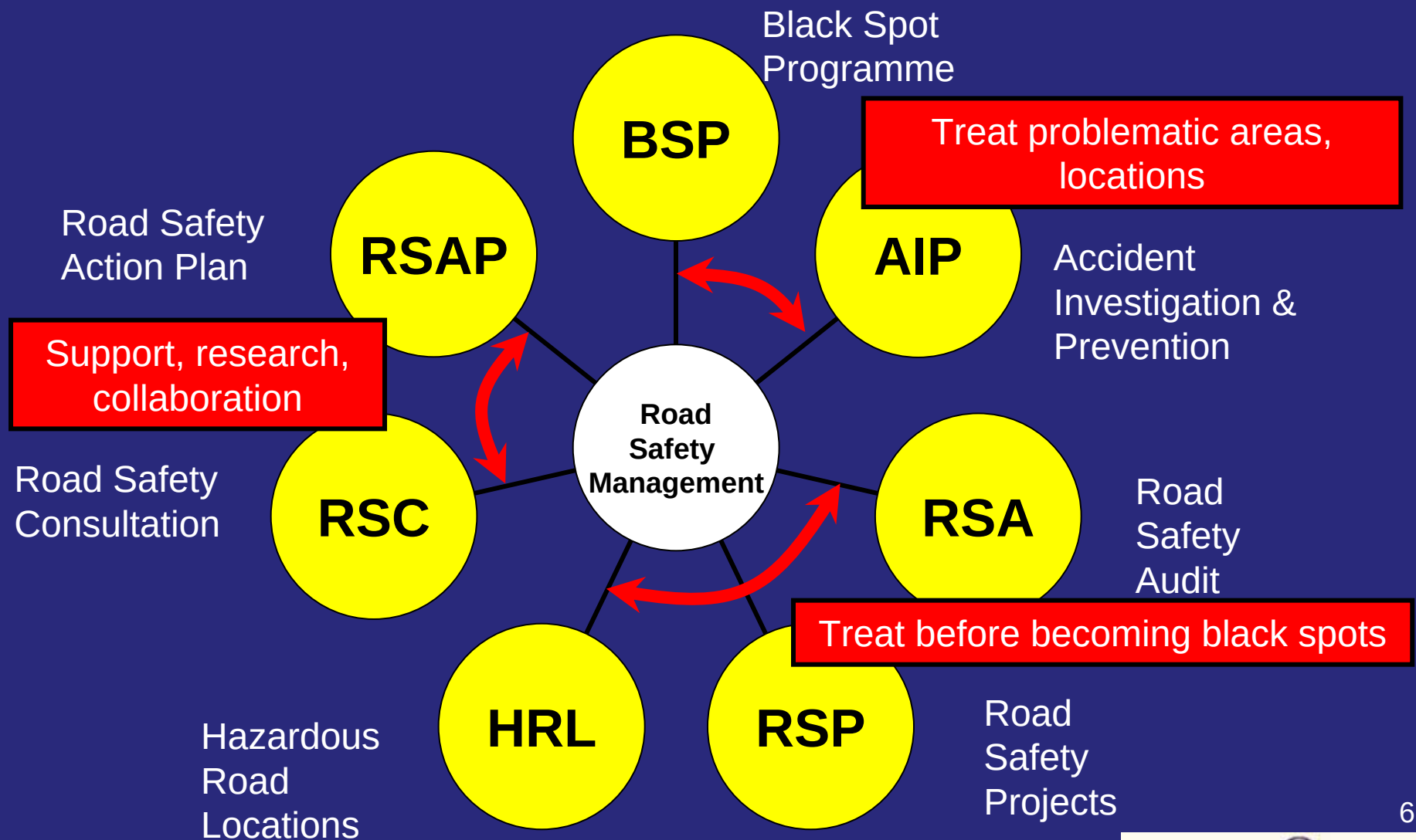


* Source data: Traffic Police, Singapore. All data accurate as at Mar 2006

Road User Fatalities



Road Safety Management



Traffic Accident Analysis Module

- An excellent tool designed to aid in our day-to-day operations, short and long term plans to improve road safety on roads
- Commissioned in Dec 04
- Accident Database Manager & Analyser
- Availability of injury accident history along all roads in Singapore



What data can be queried in TAAM

- Primary parameters such as
 - Year of accident
 - Accident severity
- Secondary parameters like
 - Time and Location data
 - Driver/Rider details
 - Pedestrian details
 - Passenger/pillion details
 - Environmental details
 - Road users/Vehicle details
- Analysis
 - Black spot analysis
 - Generate collision diagram
 - Accident rate
 - Skid resistance relationship with accidents

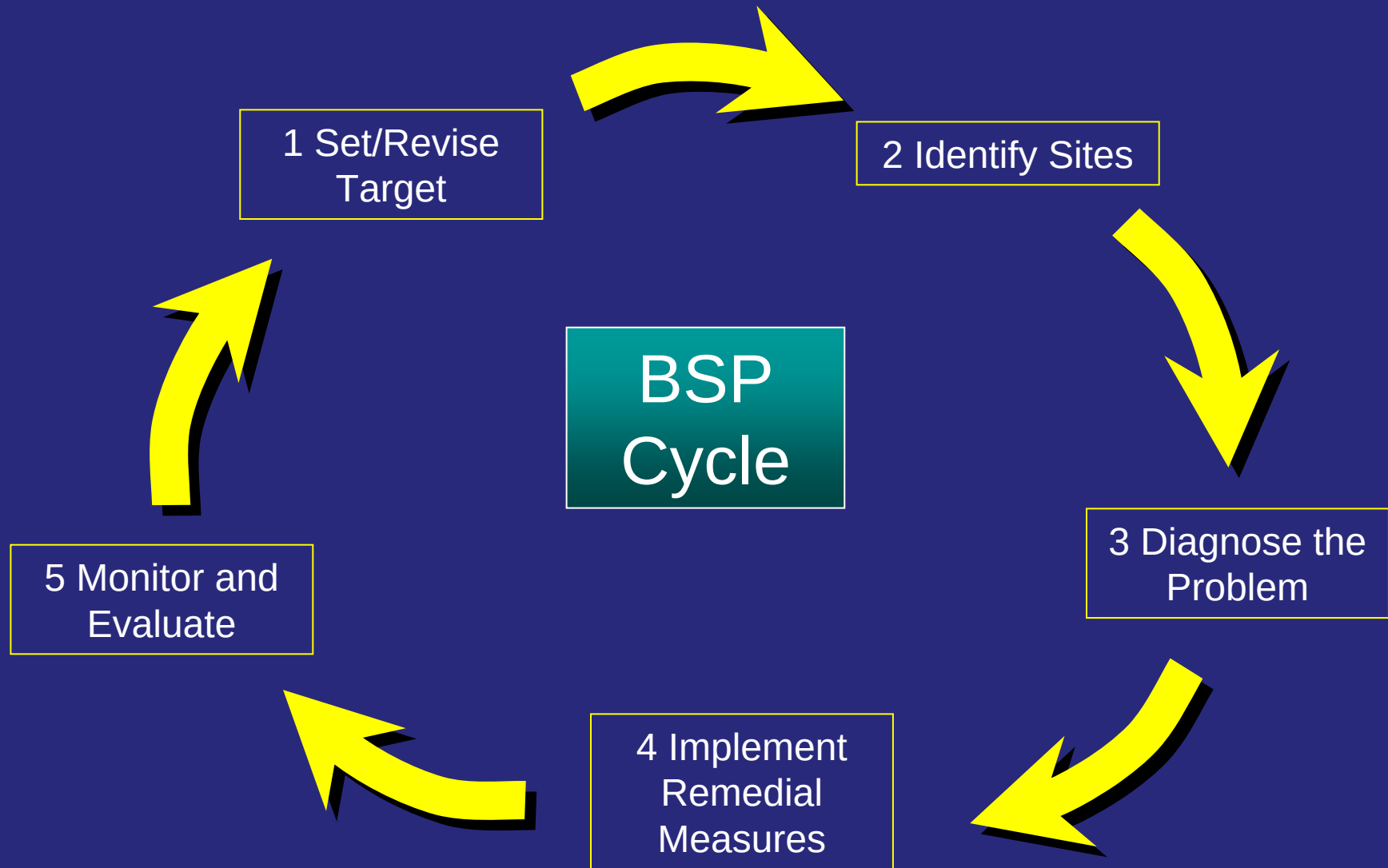
Development of TAAM

- Data cleaning and maintenance of accident records involve meticulous and tedious work
- Verification/amendment
- Detailed works involve
 - Uploading of accident data from TP on regular basis
 - Regular data quality check
 - Checking inconsistent data e.g. incorrect locations
 - Collecting TP detailed reports for verification
 - Creating route to match with KM marks along expressways
 - Updating speed limits of roads
 - Uploading of accident related data e.g. skid resistance, traffic volumes, etc

Black Spot Programme

- To identify problematic locations (sites or road length) with cluster of accidents and implement necessary countermeasures
- Hence, enable a more systematic way of tackling accident-prone locations
- Proposed strategy adopted
 - Single site treatment (e.g. intersections, bends, etc)
 - Route treatment (e.g. expressway links, arterial links, etc)
 - Mass action treatment (e.g. pedestrian accidents)
 - Area action treatment (e.g. CBD area, industrial areas)

Black Spot Programme



Black Spot Programme

- Detailed work involved for each black spot is as follows:
 - Desktop analysis of the problem
 - Retrieving reports from TP
 - Computation of accidents trend/statistics
 - Site visits (1st visit on general site layout, 2nd & 3rd on traffic observation & detailed site measurements)
 - Administration work (Apply traffic counts, consult TM, obtain ops sheet from ITSC, draw scheme, and monitor work progress)
 - Monitoring effectiveness of schemes implemented

Black Spot Programme

- Target: >15 accidents over past 3 years
- Phase I – 32 intersections + 3 interchanges
- Phase II – 33 (400m) black routes along expressways
19 sites identified to be related to wet road conditions and/or self-skidding problem
- Phase III – Route Treatment (Arterial roads, expressway slips from/to arterial roads)
 - Mass Action (e.g. Pedestrian accidents, Unsignalised intersections)
- Phase IV – Area Action (CBD, industrial area, residential estate)

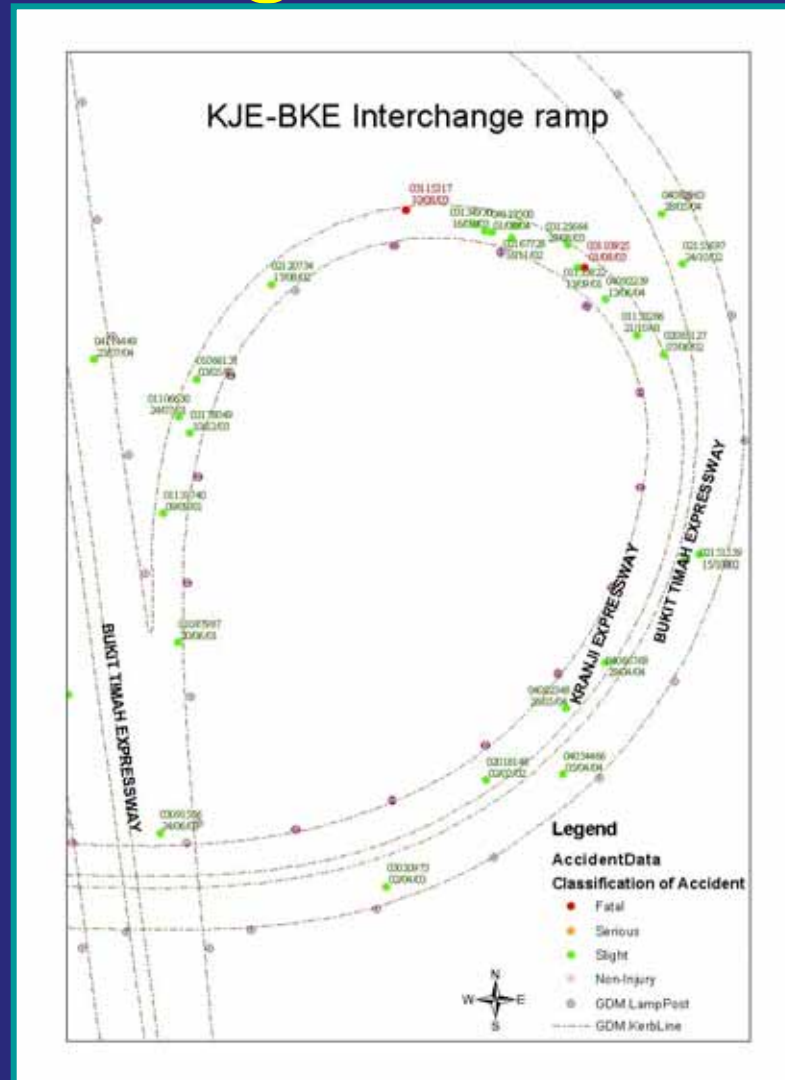
Black Spot Programme

PHASE I

Example of Black Spot Interchange: *KJE/BKE interchange*

ACCIDENT STATISTICS

- 20 cases from 2001-2004 (4 years)
- 2 Fatal accidents
- 90% involved young motorcyclists (aged 19-27 years old)
- 83% are single vehicle self-skidded accidents



Black Spot Programme

PROPOSED TREATMENTS

- Improve the super-elevation of 2nd curve to 8°
- Narrow the lane width from 4.2m to 3.7m
- Add 2 sets of 'SLOW' road markings before the bend
- Provide 'Bend Ahead' with 'Reduce Speed Now' signs
- Put 'Other Danger Ahead' (!) sign



Black Spot Programme

Example of Black Spot Junction:

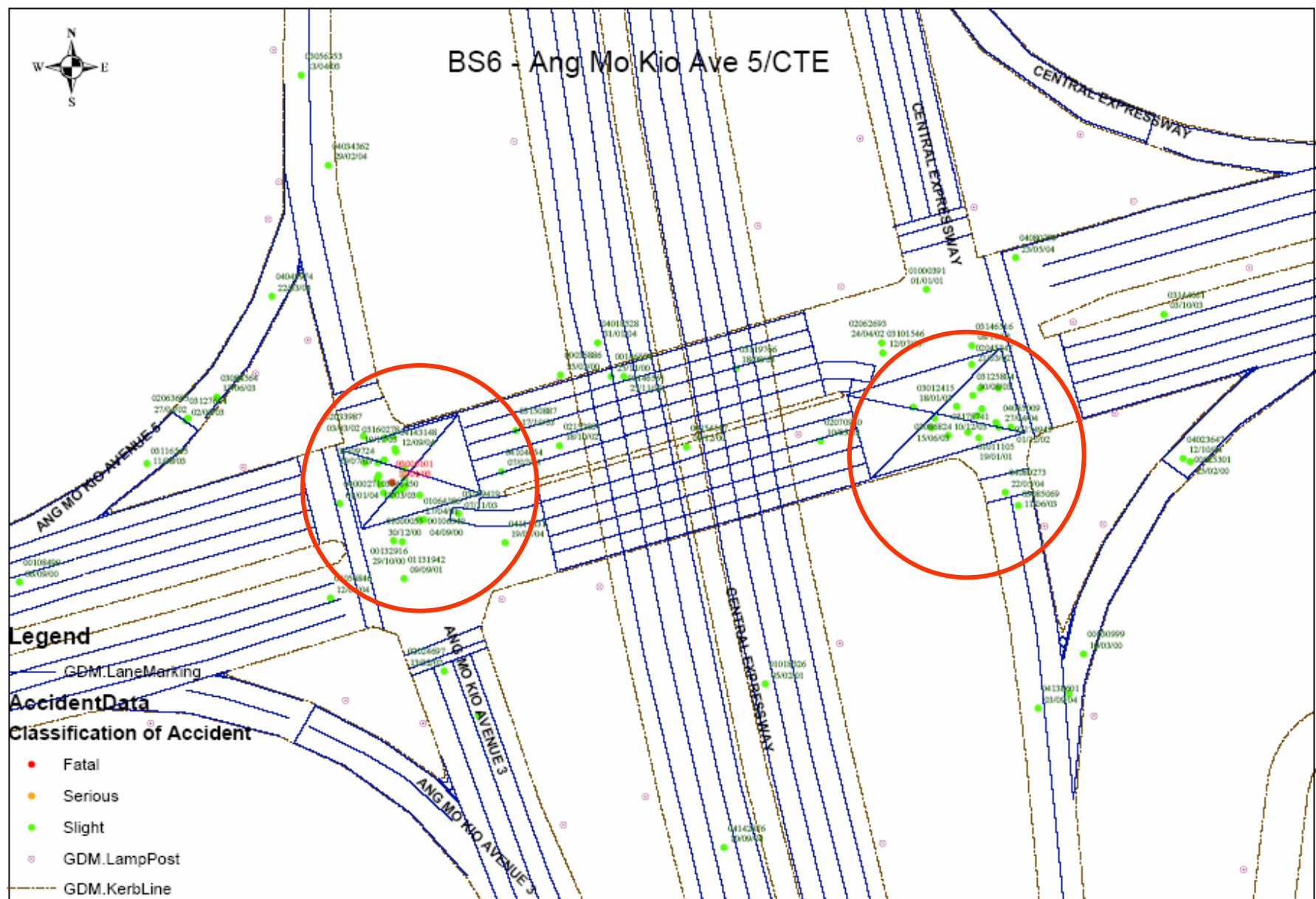
AMK Ave 5/CTE

SITE OBSERVATION

- 2 closely spaced junctions under flyover
- Wide junction with high speed limit (60kph)

ACCIDENT STATISTICS

- 71 cases (both junctions) from 2000-2004 (5 years)
- 2 Fatal accidents
- 56% involved right-turn against through accidents
- 18% involved rear-end accidents along slip roads



Accident Plain Listing

Main Selection criteria: From 01/01/2000 - To 31/12/2004 Accident Severity - Fatal, Serious and Slight

Sort By - Key Ascending

JN or AT	First street Second rd/ Landmark	IP Number	Date		MVT	DIR VEH "1"	Total cas			Description of Events A is for vehicle 1 B is for vehicle 2 etc	Crash Factors
			Day	Time			F	S	L		
			DD/MM/YY # - hol day	HHMM	RD wet dry	Fr To	A	E	T		
0001 JN	ANG MO KIO AVE 5 CENTRAL EXPWAY	005327	13/01/00 Thu	2320	D12 Dry	W E	0	0	2	M/C (Drvr 23 { A }) with M/C (Drvr 46) Through veh with right turn from opp dirn	Motorcycle { A } Turning without due care.
0002 JN	ANG MO KIO AVE 5 CENTRAL EXPWAY	025301	25/02/00 Fri	2341	D12 Dry	NE S	0	0	1	M/C (Drvr 19) with Taxi (Drvr 66 { B }) Through veh with right turn from opp dirn	Taxi { B } Turning without due care.
0003 JN	ANG MO KIO AVE 5	030999	10/03/00 Fri	1244	D02 Dry	N S	0	0	1	Car (Drvr 27 { A }) with HGV (Drvr 37 { B }) Hit rear of veh Turning right	Car { A } Failing to keep a proper lookout. HGV { B } Failing to keep a proper lookout.
0004 JN	ANG MO KIO AVE 5	036886	25/03/00 Sat	0944	D12 Dry	NE W	0	0	2	LGv (Drvr 40) with Bus (Drvr 47 { B }) Through veh with right turn from opp dirn	Bus { B } Turning without due care.
0005 JN	CENTRAL EXPWAY	049943	29/04/00 Sat	1933	D12 Dry	W S	0	0	1	M/C (Drvr 29) with Car (Drvr 29 { B }) Through veh with right turn from opp dirn	Car { B } Turning without due care.
0006 JN	ANG MO KIO AVE 5	086482	19/07/00 Wed	1758	D12 Dry	W SW	0	0	3	HGV (Drvr 30 { A }) with HGV (Drvr 38) Through veh with right turn from opp dirn	HGV { A } Failing to give way to traffic with right of way.
0007 JN	ANG MO KIO AVE 5	089569	26/07/00 Wed	2101	D12 Dry	W E	0	0	2	Car (Drvr 32 { A }) with HGV (Drvr 37) Through veh with right turn from opp dirn	Car { A } Failing to give way to traffic with right of way.
0008 JN	ANG MO KIO AVE 5 CENTRAL EXPWAY	102856	26/08/00 Sat	1937	D12 Dry	E N	0	0	1	HGV (Drvr 40 { A }) with M/C (Drvr 41) Through veh with right turn from opp dirn	HGV { A } Failing to keep a proper lookout.
0009 JN	ANG MO KIO AVE 5 CENTRAL EXPWAY	106349	04/09/00 Mon	2029	D17 Dry	E N	0	0	1	M/C (Drvr 19 { A }) with Car (Drvr 54 { B }) Hit veh opp dirn On straight	Motorcycle { A } Disobeying traffic lights signals resulting in accident with vehicle. Car { B } Disobeying traffic lights signals resulting in accident with vehicle.
0010 JN	ANG MO KIO AVE 5 CENTRAL EXPWAY	132916	29/10/00 Sun	1803	D12 Dry		0	0	1	HGV (Drvr 29 { A }) with Bus (Drvr 40) Through veh with right turn from opp dirn	HGV { A } Failing to give way to traffic with right of way.
0011	ANG MO KIO AVE 5	139997	10/11/00 Fri	1115	D12 Wet	E SW	0	0	2	M/C (Drvr 20) with Car (Drvr 33 { B }) Through veh with right turn from opp dirn	Car { B } Failing to give way to traffic with right of way.
0012 JN	ANG MO KIO AVE 5 CENTRAL EXPWAY	154147	09/12/00 Sat	2052	D12 Dry	N S	0	0	1	M/C (Drvr 22) with Car (Drvr 42 { B }) Through veh with right turn from opp dirn	Car { B } Failing to give way to traffic with right of way.
0013 JN	ANG MO KIO AVE 5	000055	30/12/00 Sat	1528	D02 Dry	W NE	0	0	4	LGv (Drvr 35 { B }) with HGV (Drvr 40) Hit rear of veh Turning right	LGv { V } Defective brakes.

Source: Traffic Police

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Black Spot Programme

PHASE II

- A total of 33 (out of 632=5%) 400m e'way routes are identified to have accidents >15 accidents over 3 years
- Locations are ranked according to
 - Total number
 - % of wet accidents
 - % of self-skidded accidents
- A list of 19 locations (with $\geq 30\%$ wet accidents/self-skidded accidents) are given to RM to consider for resurfacing
- RSEU will still conduct site checks for all 33 locations

Accident Investigation & Prevention



Accident Investigation & Prevention

- TP informs LTA whenever fatal accident occurs
- Use TAAM to check the historical accident records of the particular location
- Conduct site investigation for any deficiency of the road that may contribute to the accident
- Recommend and implement remedial measures
e.g. Install 'Bend ahead' signs, 'Slow' markings, guardrails, center divider, inform RF to check street lighting levels, NParks to trim foliages
- Monitor after implementation

Accident Investigation & Prevention

- An average of 188 fatal accidents per year are investigated
- Cases where we do not investigate includes drink driving, punctured tyres, etc.



Road Safety Audit

- Roads are scheduled for auditing based on descending road speed limits
- Accident records serve as a supplement for quick check on the general idea of the safety level of that road length before audit commences
- Approximate 500km of arterial roads to be audited over 10-year cycle
- Target to audit 50km of roads per year

Road Safety Audit

Some improvements from RSA



**Crash cushion saves
more lives @ hard gore
area**



**Uncovered drain poses
additional hazard on
road**



Exposed parapet wall

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Road Safety Projects

- Safety concerns can be identified from accident records and more safety improvements can be explored accordingly
- After implementation, accident records can be monitored to evaluate effectiveness

Road Safety Projects

- Current & Proposed Projects
 - Safety Improvement targeting at locations

Current Projects

- At zebra crossings (e.g. LED Flashing Beacon on trial, New Flashing Beacon height)
- At bus stops (e.g. bollards)
- Near intersections (e.g. Advance Warning Light)
- Along slip roads (e.g. high entry angle treatment)



Road Safety Projects

– Safety Improvement targeting at vulnerable road users

- Motorcyclists (e.g. Motorcycle friendly guardrails)
- Pedestrians (e.g. Intelligent Road Studs)
- Elderly (e.g. install railings, smoothen footpath, longer green time (under trial))



Road Safety Projects

– Elderly Friendly Facilities at Toa Payoh



Hazardous Road Locations

- A proactive and preventive measure to treat sites before accidents take place
- Usually from feedbacks and staff suggestions
- Provide remedial measures e.g. gore area treatment (object marker, signs), ramp-down Vehicular Impact Guardrails, railings



Road Safety Consultation

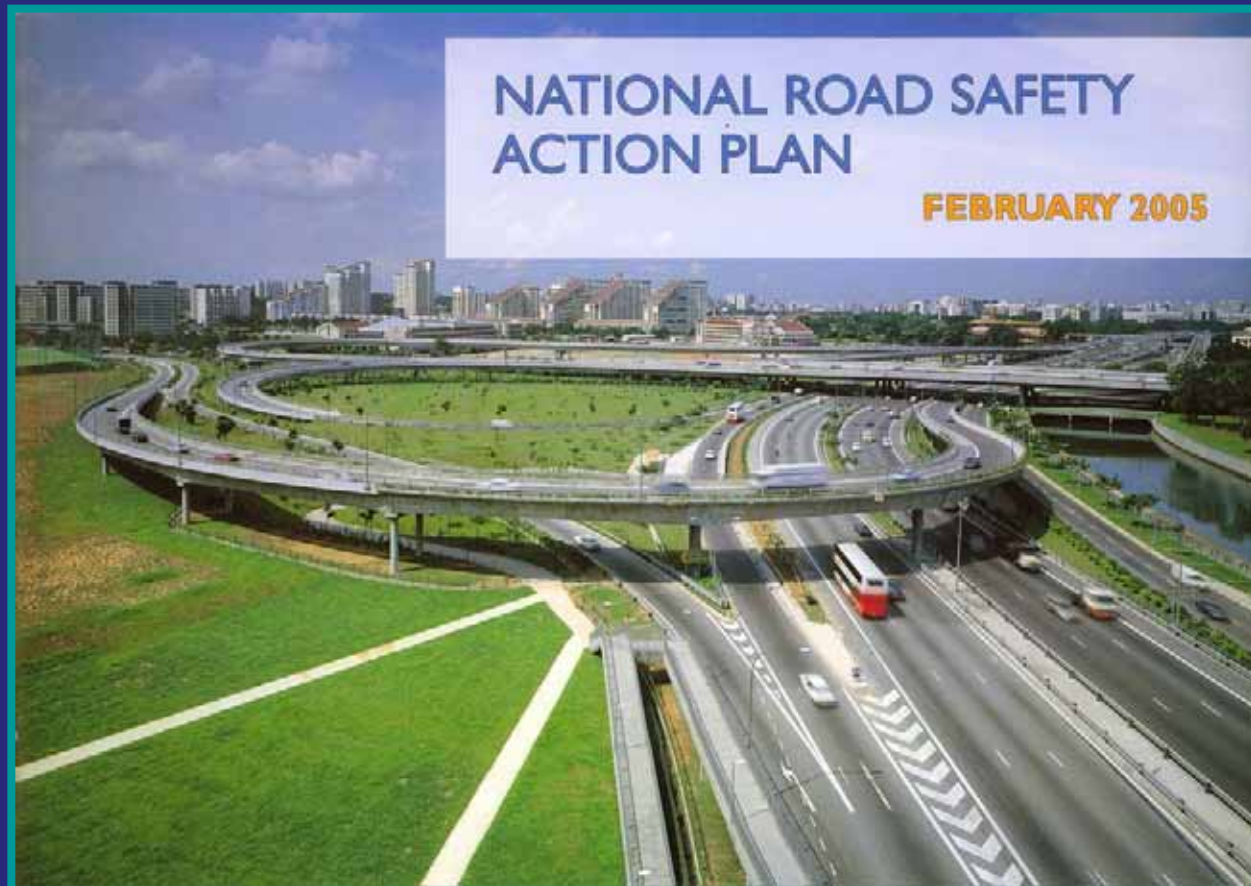
- Provide road safety consultation to other Departments:
 - Design Dept (e.g. widening of ECP/PIE)
 - Road Structure and Facilities Management (e.g. accidents that occurred during night-time)
 - Road Management (e.g. accidents related to wetness of road, self-skidding)
 - Traffic Management (e.g. accidents records of localised safety problems)
 - RM, RF and ITSC on frequently hit locations
 - Public feedbacks on hazardous locations

Road Safety Consultation

- Provide road safety consultation to others:
 - Training courses and Consultancy Services on Road Safety Engineering to overseas delegates
 - Vietnam
 - Laos
 - Cambodia
 - Sri Lanka
 - Myanmar
 - Bangladesh
 - Brunei
 - Maldives
 - Bhutan
 - Serbia (Yugoslavia)
 - Philippines
 - Zimbabwe
 - Palau
 - Thailand



Road Safety Action Plan



Road Safety Action Plan

- Oversee and run 5-year RSAP with TP, NSC and others
- Reduce 100 fatalities over 5 years from 2004 to 2008

- Covers 14 sectors under 5 Es:

- Encouragement
- Education
- Enforcement
- Emergency Preparedness
- Engineering

Engineering

- Road Accident Data Systems
- Safe Planning and Design of Roads
- Vehicle Safety Standards
- Improvement of Hazardous Locations
- Road Safety Research
- Road Accident Costing

Road Safety Action Plan

Encouragement

- Co-ordination and Management of Road Safety
- Road Safety Funding and Role of Insurance Industry

Enforcement

- Enforcement
- Legislation

Education

- Road Safety Publicity Campaign
- Road Safety Education of Children
- Driver Training and Testing

Emergency Preparedness

- Emergency Assistance to Accident Victims

Thank You